

General Survey on Development of Wild Edible Fungi in Yunnan Province, China

SHEN Jie

(Yunnan Association of Edible Fung and Scientific and Technologic Department of the Yunnan
Province Supply and Marketing Society, Kunming 65000, China)

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Yunnan Province is located at latitude from 21° 32' N to 29° 15' 8" N and longitude from 97° 31' 39" E to 106° 11' 47" E, with elevations from 76.4 m to 6 740 m, covering an area of 383, 000 square meters. 94% of its territory are mountain areas, of which, 61% are forests. And, 77% of its populations live in the mountain areas. Affected by interactions between the warm currents from the Pacific Ocean and that from the India Ocean, Yunnan has several quite distinctive climates, including frigid zone, temperature zone, subtropical zone, tropical zone, etc., formed according to different elevations. For the reason, Yunnan is a wonderful place for natural reproduction of various plants, animals and fungi. There are more than 850 species of wild edible fungi and medicinal fungi in Yunnan Province, and it is one of the important reserves of natural resources in the world, especially mycorrhizal fungi more indispensability for trees growth and development in the forest. Among the wild mushrooms in Yunnan, ectomycorrhizal edible fungi are most famous in the world, including Chinese truffles (*Tuber indicum et al.*), matsutake (*Tricholoma matsutake*-group), chanterelle (*Cantharellus cibarius*), porcini (*Boletus cf. edulis*), milk cap (*Lactarius* spp.), green russula (*Russula virescens*), egg yellow mushroom (*Amanita*, hemibapha), the deceiver (*Laccaria laccata* et al), etc. Every year, when the raining season comes, more than 200 species of wild edible mushrooms are appeared for sale in fresh markets in Yunnan.

Current situation of edible fungi industry in Yunnan Province

Edible fungi are produced throughout the prov-

ince. According to uncomplete statistics in 2006, Yunnan province produced 660.75 million tons of mushrooms, with value of RMB1.74 billion. And, according to the Kunming Customs, the province exported 8, 049 tons of mushrooms in the same year, with value of US \$ 91.39 million dollars. During the period of China's Tenth Five-year Plan (2001 - 2005), Yunnan totally produced mushrooms of 162, 000 tons, with value of RMB5.07 billion yuan, and exported 33, 000 tons with value of US \$ 32.6 million. The annual growth rates for its mushroom yields, output value, export volume and export value are 37.3%, 25.4%, 20.4% and 18.3%, respectively. For many years, the export value of mushrooms are ranked the second among that of farm produce in the province, just following tobacco industry. And its export of wild mushrooms are always listed the first among that of provinces in China, and most of them are ectomycorrhizal edible fungi, such as matsutake, *Boletus edulis*, Chinese truffles, chanterelle, etc. All of ectomycorrhizal edible mushrooms should be grown in the natural forests. And, at present, the government of Yunnan province are carrying out reforms on forests management system, returning the right of management of 290 million *mu* (1 hectare = 15 *mu*) collective forests to farmers, which are related to 36 million farmers in 129 counties in the province. The collective groups make contracts with farmers to manage forests. There are 6.288 million poverty-stricken people in the 73 state-level anti-poverty development counties distributing and living in mountain areas. The reform will greatly encourage farmers to plant trees and get-off poverty. Aiming at "mountain has its owner, owner has his right, right has its obligation, ob-

ligation has its profits”, the reform is set off in Yunnan province in 2006, with 195 . 6 million *mu* forests in 9 counties as experimental areas . Their experiences are introduced to Pu er City and Dali Prefecture this year . It is planned to be accomplished in 2008 . When the objectives of forest reform is realized, the environment for wild mushrooms will effectively preserved, which will greatly slow down the disappearance of mushroom species resources, and will improve the quality of wild mushrooms . It will also provide a wide range of forest species for scientific research on wild ectomycorrhizal mushrooms, and lay a solid foundation for introduction and domestication of wild mushrooms .

Farmers contribution to the conservation and utilization of wild edible mushrooms

Most of the 36 million farmers in Yunnan province are living in mountain areas . They make their livelihood on forests and conserve them, and have deep feelings with forests, because edible mushrooms grown in forests are major resources of their economic incomes . Farmers in Yunnan province made two contributions to the conservation and utilization of wild edible mushrooms . One is, some farmers and village supervisors in villages such as Xiaoshao of Yiliang county, Songhe of Eryuan county and Anhua of Jiangchuan county, etc ., initiated to tentatively contract forests in the late 1990 s . By the way of contractor management, the production of wild mushrooms is increased and their quality is improved . Meanwhile, natural resources are effectively preserved . Both farmers and village collective groups are benefited from the experiment . Consequently, economic benefit, social efficiency and ecological efficiency are harmoniously increased . The other is Mr Li Hongbin s morel cultivation at his courtyard . Mr Li Hongbin, a farmer in Ludian village, Yulong county, Lijiang City in northwest Yunnan Province, pioneered morel experimental cultivation in his courtyard in 2002 after several years of trading morel . He was succeeded in 2003, and kept on his cultivation through these years, with output value of more than RMB20, 000 per *mu* (1 hectare = 15 *mu*) . About 400 households in the village followed him to cultivate morel . Experts

considered it as bio-cultivation after preliminary identifications . It has been directing scientific research on morel artificial cultivation .

Scientific research on wild mushroom introduction, domestication and conservative promoted cultivation for the past years

Scientists and technologists in the field of mushrooms have done a lot of research works . The most successful researches on mushroom introduction and domestication are as follows: (1) Supported by the Government of Yunnan province in 1982, Mr . Liu Zhengnan, a researcher from Kunming Edible Fungi Research Institute, and Mr . Li Yuanxi from Yunnan Non-staple Foodstuffs & Fruits Company, jointly organized a research team on wild tremella resources . They made a general survey on tremella resources and worked on artificial introduction and domestication of it . For their complete research, at present, cultivations by both logs system and bags system are conducted in Yunnan province, with productions according to market demand; (2) Research on artificial promotion production and conservative management of matsutake, which started in 1997, was headed by Prof . Gong Mingqin of Guangdong Forest Scientific Research Institute . He carried out his research work at Haitang village of Baoshan City, and, made some achievement . In addition, following the way Ms . Su Kaimei and her colleagues from Chuxiong Forest Research Institute undertook a scientific research project for Yunnan Science & Technology Bureau in 2000 on conservative promoted cultivation of matsutake . They developed a complete techniques, which was applied in 140, 000 *mu* forest land in Chuxiong, and increased the yields and improve qualities of matsutake, with production of 72 tons and value of 20 million yuan . The similar research was also conducted by senior engineer Mr . Wang Yukang of Nanhua Forest Bureau, who also undertook a project aided by funds of Yunnan Science & Technology Bureau and made research on conservation promoted cultivation of matsutake in 1999 . His achievement was also widely applied in Wujie Village of Nanhua County, and demonstrated in the whole county . (3) in 1986, through

many years of experience of domestication and selective cultivation, Mr. Luo Xingye, an associated professor of Kunming Edible Fungi Research Institute, obtained strains of *Schizophyllum commune* from a stake of yellow oak in western Yunnan province by the way of tissue isolates. After purgation and selective cultivation, he developed pure strains of wild *Schizophyllum commune* of Yunnan province, and was succeeded in his experimental cultivations of tens thousand of bags in different places and different seasons. His techniques was granted patent on August 4, 2004 in Yunnan province, with letters patent No. ZL001 12649.0. (4) In August 2002, professor Liu Peigui and his co-workers from Kunming Botany Research Institute of China Science Academy, conducted an experimental cultivation of milk cap (*Lactarius* spp.) on forest land of 38 mu in Hebian Village of Qianmai Town of Lancang County, an anti-poverty program supported village by the institute. Under conditions of natural draught in 2005, 2006, 2007 and 2008, large quantity of the mushroom have been produced, with an average yields of 1 kg mushroom per square meter, harvested from July to November. Almost no wild mushroom is produced in the surrounding forests. However, every household of 80 in the village can earn about 1,000 yuan from their mushroom cultivation, even 1,600 yuan for the most. The program is quite popular among the local farmers. And now, it is being introduced to other villages, even to the whole county. (5) As for research on artificial cultivation and conservative promoted cultivation of GanBaJun (*Thelephora ganbajun* Zang) and Chinese truffles (*Tuber indicum*) et al., professor Li Zhuo, from Microbiology Research Institute of Yunnan University, Mr. Zhou Bin from Life Science Research Institute of Yunnan University, and other experts from Yongsheng Lvdiyuanyuan Corporation and Kunming Research Institute have been making experimental research, successively, and have preliminary good results. But many works still needed to be done on this regards.

Policy of Government on Edible Fungi Industry

In order to developing the edible fungal characteristic industry of Yunnan province, fostering structural

adjustment among industries and helping poverty-stricken farmers in mountain areas to be rich, the People's Government of Yunnan Province issued the document Re: *Opinions on Fostering Development of Edible Mushroom Industry* (Yun Zheng Fa No. [2001] 170) in 2001, which considered mushroom as an industry and listed it on the governmental agenda. And, in 2007, the provincial government once again issued the office document Re: *Opinions on Pushing on Further Development of Edible Mushroom Industry* (No. [2007] 21), with 8 items and 24 articles, totally. Its main contents are as follows: fully understanding the great significance of pushing on further development of edible mushroom industry; ways and objectives of pushing on further development of edible mushroom industry; transforming the current mode of management to upgrade the development and utilization of wild mushrooms; making great effort to develop mushroom cultivation to enlarge edible mushroom industry; enhancing high-tech processing products development to improve economic efficiency of the industry; actively expanding markets both at home and abroad to establish the brand "Yunnan Mushrooms"; establishing scientific platform to provide technique support for pushing on further development of edible mushroom industry; emphasizing on services to keep fast and healthy development of mushroom industry.

At present, the development of Yunnan ectomycorrhizal edible mushroom is at the stage of experiment and research. Both the reforms on the management of forests and policies of Yunnan provincial government for further development of edible mushroom industry provide a fundamental condition and policy support for the development of wild ectomycorrhizal mushroom. Research on ectomycorrhizal mushroom technology and widely application of their results will become a new flash in the development of wild edible mushrooms in Yunnan Province, and lead the continuous development of mushroom industry—one of the characteristic industry of Yunnan Province. We sincerely welcome experts and entrepreneurs from all over the world to come to Yunnan to make scientific research and invest in edible mushroom industry, for common sustainable development and bi-wins.